DIE CASTING ENGINEER

SDCE

December, 1958

SFDS CORRECTED

Look for . . .

- ***DIE CASTING MACHINE STANDARDS***
  SDCE Platen Plan Standards.—Page 6
- ***HYDRAULICS BOOST DIE CASTING PROGRESS***
  Advancement in die casting technology.—Page 8
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  1959 election results.—Page 12

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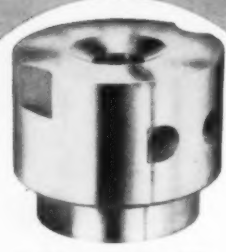

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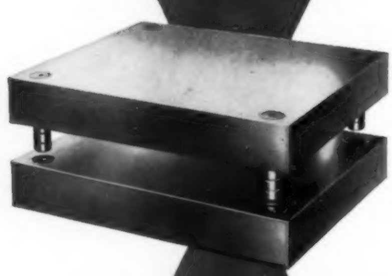

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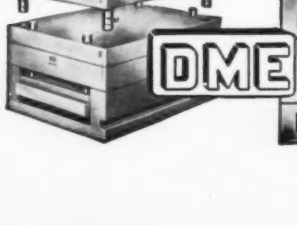

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COVER

Cleveland's inner harbor, the meandering Cuyahoga River, where vessels call weekly from Europe and South America from May to November bringing wood pulp, aluminum scrap, tinned and smoked fish, and flower bulbs and return with cargoes of trucks and tractors, special steels and miscellaneous manufactures. In the background is Terminal Tower, the city's landmark. Cleveland is the home of Chapter 6 of the SDCE.

The DIE CASTING ENGINEER is published quarterly by The Society of Die Casting Engineers, Inc.—a society for the improvement and dissemination of the knowledge of the arts and sciences of die casting, the finishing of metals, and the allied arts. The DIE CASTING ENGINEER offers a concentrated coverage of management and engineering in the die casting and directly related industries.

Only advertising pertaining to die casting and finishing of metals and the allied arts is acceptable. The Society reserves the right to reject any advertising deemed objectionable for any reason what-so-ever.

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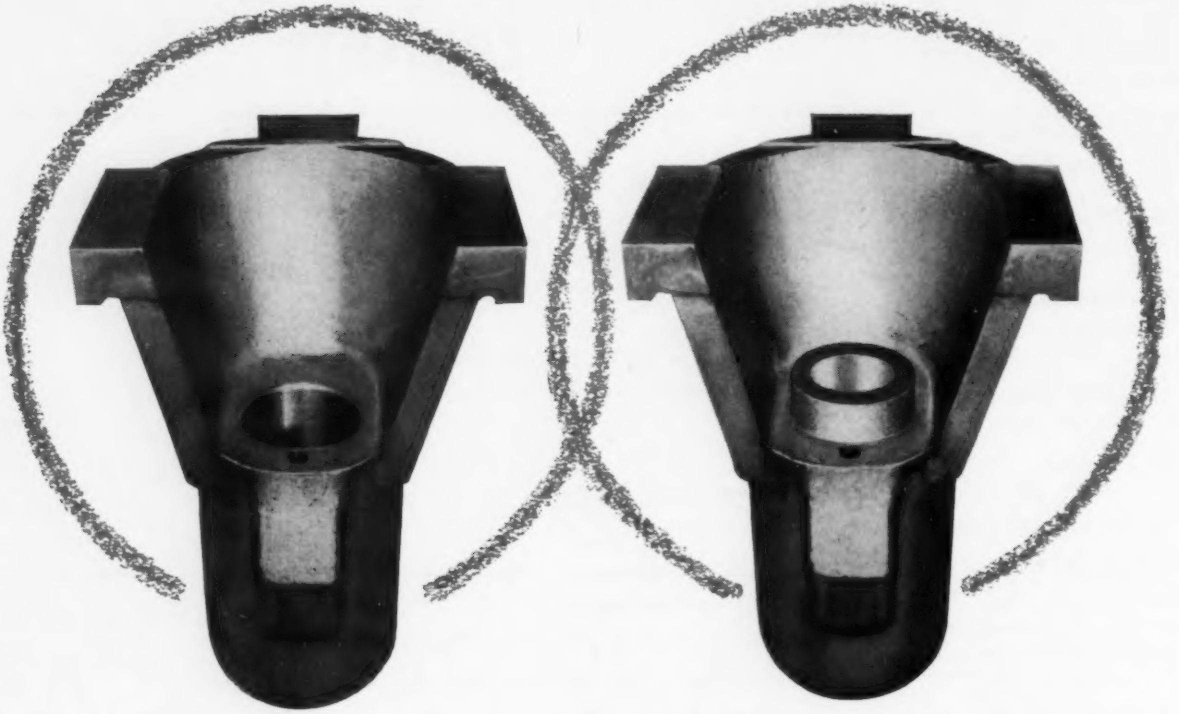


THE SDCE NATIONAL STANDARDS COMMITTEE working with the manufacturers of die casting machines has finalized a group of Platen Plan Standards. Additional standards to be published in the next issue are being completed now. It is hoped these standards will serve industry and government in making the interchangeability of dies on various die casting machines easier.

The Society of Die Casting Engineers

DIE CASTING MACHINE STANDARDS

PLATEN PLAN STANDARDS

A. KNOCKOUT PIN LOCATION

1. SCOPE

This standard is intended to specify size and location of knockout pin holes in the moving platen of die casting machines having a clamping capacity of from 50 to 2,000 tons, inclusive.

2. SPECIFICATION

Knockout pin holes shall be of a size and location in accordance with SDCE drawing entitled: "Drawing No. 1—SDCE Die Casting Machine Knockout Hole Pattern," within the limitations imposed by platen size and machine structure. This pattern may be established along the horizontal and/or vertical centerline of the platen.

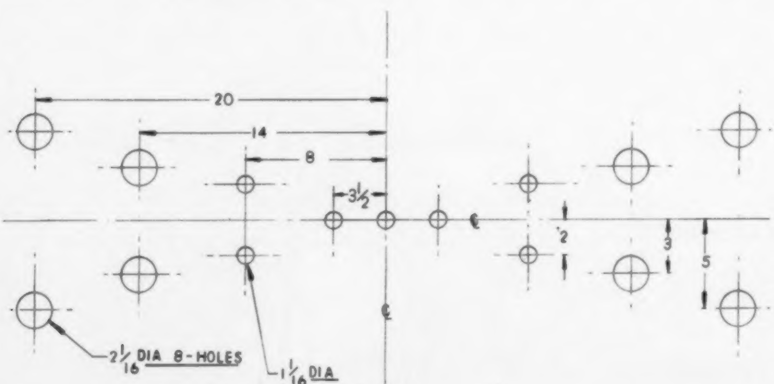
B. PLATEN BOLTING OR T-SLOT PATTERN

1. SCOPE

This standard is intended to specify the size and location of tapped holes or T-slots in the stationary and moving platens of die casting machines having a clamping capacity of from 50 to 2,000 tons, inclusive.

2. SPECIFICATION

a. Drawing entitled: "Drawing No. 2—SDCE Die Casting Machine Bolting or T-Slot Pattern," shows the recommended standard centerline pattern which shall be used for the location of either tapped holes or T-slots in machines having a clamping capacity of from 50 to 600 tons, inclusive.



DRAWING NO. 1—SDCE Die Casting Machine Knockout Pattern.

NOTE: Knockout pin holes shall be within the limitations imposed by platen size and established along the horizontal and/or vertical centerline of the platen.

b. Drawing entitled: "Drawing No. 3—SDCE Die Casting Machine Bolting or T-Slot Pattern," shows the recommended standard centerline pattern which shall be used for the location of either tapped holes or T-slots in machines having a clamping capacity of from 601 to 2,000 tons, inclusive.

c. T-Slots shall be cut according to the grid patterns within the limitations of machine structure and shall be in accordance with ASA Standard B5.1—1949. T-Slots cut on this grid pattern need not intersect. T-Slots shall be cut for bolt sizes according to rated machine clamping tonnage as follows:

Machines 50 to and including 199 tons—⅝" T-slot bolts
Machines 200 to and including 600 tons—¾" T-slot bolts
Machines 601 to and including 2000 tons— 1" T-slot bolts

d. Tapped holes in machines having a clamping capacity of from 50 to 600 tons, inclusive, shall be located on the grid pattern intersections. From this intersection, holes shall be spaced outward at 3" center to center increments, within the limitations imposed by the machine structure.

e. Tapped holes in machines having a clamping capacity of from 601 to 2,000 tons, inclusive, shall be located on the grid pattern intersections. From this intersection, holes shall be spaced outward at 6" center to center increments, within the limitations imposed by the machine structure.

f. Tapped holes shall be U.S. Standard coarse thread—class 3, in accordance with Table "A." Bolt sizes shall be in accordance with specified tonnage of machine.

g. T-Slots and/or tapped holes may be provided at the option of the purchaser.

SIZE	THREAD	MINIMUM DEPTH FULL THREAD	MACHINE TONNAGE
⅝"	⅝"—11	1"	50 to 199 tons inclusive
¾"	¾"—10	1¼"	200 to 600 tons inclusive
1"	1"— 8	1½"	601 to 2000 tons inclusive

TABLE A

C. HYDRAULIC EJECTION CYLINDER

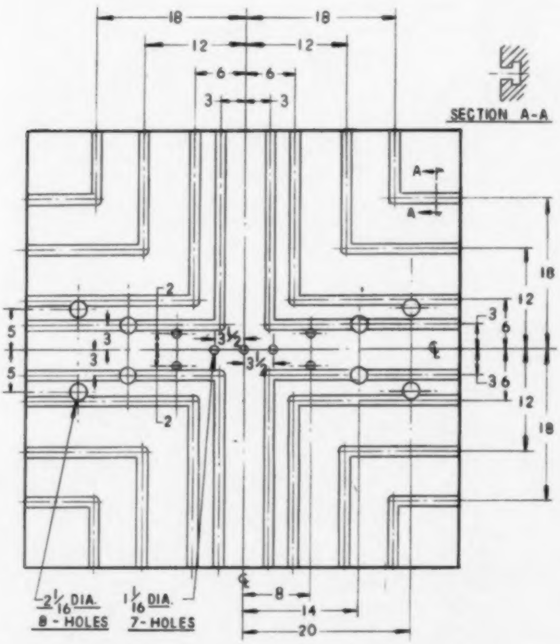
When a hydraulic ejection cylinder is incorporated into a die casting machine, it shall be located on the intersection of the vertical and horizontal centerlines of the T-slot or platen bolting grid pattern.

D. ALUMINUM DIE CASTING MACHINES—SHOT SLEEVE LOCATION

The shot sleeve location shall be determined on multiples of 3" center to center increments from and including the centerline of the vertical platen pattern.

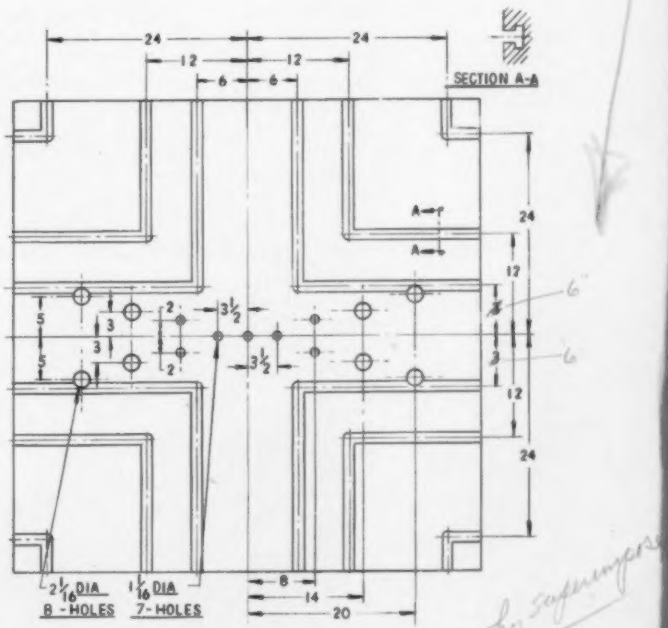
E. HOT CHAMBER DIE CASTING MACHINES—NOZZLE LOCATION

The nozzle location shall be determined on multiples of 3" center to center increments from and including the centerline of the vertical platen pattern.



DRAWING NO. 2—SDCE Die Casting Machine Bolting or T-Slot Pattern.

NOTE: This standard is to specify the location of tapped holes or T-Slots for die casting machines having a clamping capacity of 50 to 600 tons inclusive.



DRAWING NO. 3—SDCE Die Casting Machine Bolting or T-Slot Pattern.

NOTE: This standard is to specify the location of tapped holes or T-Slots for die casting machines having a clamping capacity of from 601 to 2000 tons inclusive.

More castings every hour every day when . . .

HYDRAULICS BOOST DIE CASTING PROGRESS

by L. W. HAISEN
Manager, Grand Rapids Office
Machinery Hydraulics Division, Vickers Incorporated
Division of Sperry Rand Corporation

HOW TO GET MORE AND BETTER CASTINGS per hour and per day, that is the question. Answers to it generated many technological advances in die casting; but progress is insatiable, feeding on every improvement no matter how small and hungering for more.

The die casting industry had its origin hundreds of years ago with hand ladling of molten metal into crude mold forms. Today it is a completely automatic push-button operation made possible by hydraulics. There were problems with each step forward. Now, there are new goals and new obstacles in the way. The die casting industry continually meets and overcomes obstacles to progress, attaining goals once impossible even as wish fulfillments.

Obstacles exist in almost every phase of die casting. Most of them are metallurgical, presenting problems not only to machine and die design, but also to the metals being cast. Difficulties arise at elevated temperatures that do not exist at lower temperatures. An example is the adverse effect molten aluminum has on a submerged gooseneck and shot mechanism such as that used in a zinc machine. Higher heat ranges represented by the melting point of new metals, not heretofore cast, present a new set of problems yet to be solved.

Die makers constantly strive to improve surface finish, meet closer tolerances and provide greater structural strength in the cast part. Improvements here reduce, and in some cases, eliminate machining time on the casting. New combinations of die and casting materials are sought to extend die life and lower costs.

Hydraulically, the apparent answer to more production is to increase the speed of the casting machine. Larger pump capacity, accompanied by appropriate increase in power input and valve sizes certainly produces a faster cycle. Unfortunately, there are prior considerations which must be entertained before these steps can be taken. The machine itself must be designed to accommodate the increased shock that occurs when heavy machine members are accelerated and decelerated. To take full advantage of the potential of any increase in speed, it is natural to postpone the start of deceleration. The shorter the alloted distance for deceleration, the greater the shock. If no deceleration is provided, the velocity the machine can tolerate at the termination of the cylinder stroke becomes the problem, and the answer can be given only by the machine designer.

A prominent die casting machine builder recently standardized some of his larger model machines with hydraulic circuits employing a Vickers double pump V-453-FT. This pump has a combined volume of 87.9 gpm at zero psi. The

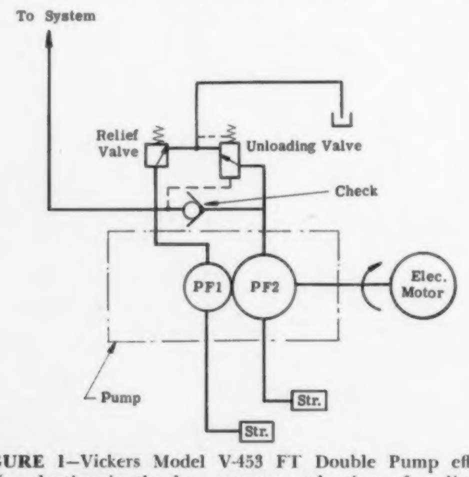


FIGURE 1—Vickers Model V-453 FT Double Pump effects an 83% reduction in the low pressure cycle time of a die casting machine when used in essentially the same hydraulic circuit as the pump it replaces. Larger valves and line sizes accompany the change.

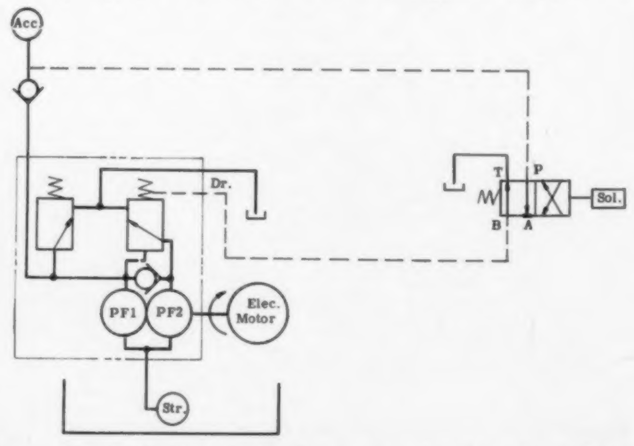


FIGURE 2—Combination of pump capacity, accumulator charge pressure and cycle time is such that the accumulator does not have time to get fully charged. Gradual decrease of pressure results. This problem is solved by increasing the size of the high pressure pump, or by taking advantage of the momentary overload characteristics of the electric motor.

hydraulic circuit is shown in Figure 1. It replaces a combination pump with 48 gpm at zero psi. The replacement represents an 83% increase in speed for the low pressure functions. External valving is used to combine the two volumes of the pump and to provide automatic pressure unloading of the large (58.8 gpm) side of the pump. This large unit is used in the same circuit as the pump it replaced. Of course, larger valves and line sizes accompanied the change.

In another application a supplemental valve arrangement was incorporated to cope with the limitations in valve sizes presently available. In this circuit the accumulator has the equivalent of a 3-inch line direct to the shot cylinder, thus contributing greatly to increasing the shot speed.

Due to the size and shape of some parts it is possible to cycle a die casting machine so fast that it exceeds the recovery time of the accumulator. When this happens the accumulator never gets fully charged, resulting in a continually decreasing shot pressure until it is no longer possible to continue at the chosen cycle rate. A typical example is shown in Figure 2.

The large volume pump is not available to charge the bottle when it never goes above 500 psi. To produce 400 cycles per hour of 215 cubic inches of oil per cycle from the bottle, it is necessary to put this much oil into it with a pump of 1000 psi capacity. See Figure 2.

$$\frac{400 \times 215}{60 \times 231} = 6.2 \text{ gpm}$$

Since the available time to charge the bottle is 5/9 of the overall cycle time, the pump should be $6.2 \div 5/9$ or 11.1 gpm. This is more than the 10.3 gpm that may be expected from the small pump at 1000 psi. The solution to this problem appears to be a larger pump. The pump that brings the bottle up to charge pressure (usually 1000 psi) requires a motor of appropriate horsepower making it a matter of vital concern when choosing pumps and pressures.

Another method of hastening the recovery of the accumulator takes advantage of the momentary overload characteristics of the electric motor. This is accomplished by intentionally delaying the automatic unloading of the larger side of the double pump, thus making both sides of the pump feed the bottle at a faster rate. If the large volume side of the pump is prevented from unloading for a brief period, it provides a source of oil of 43.8 gpm to charge the bottle to 1000 psi. This overloads the motor as follows:

@ 950 psi on large volume side – 28.4 hp
@ 1000 psi on large volume side – 31.1 hp

The overload starts at 42% @ 900 psi, assuming the charge takes place only when the die is open and the 2000 psi pump is unloaded. Thus the time of overload is 2 seconds out of a cycle time of 9 seconds. The overload is a little in excess of 22% of the time, at a maximum of 55%. This is not an unreasonable overload.

Another method of speeding up the machine cycle uses the accumulator for closing and opening the die. If the curing time and loading time is long enough to allow accumulator recovery, this method can be used to good advantage. A variation of this idea that is coming into greater practice is the use of a separate accumulator for the die cylinder. This offers the advantage of a system that does not interfere with the shot pressure. In an aluminum die casting machine, it is absolutely necessary that a separate bottle be used for closing the die. If the same bottle is used for closing and for the shot, pressure becomes too low for a satisfactory shot because the aluminum machine requires a long closing stroke.

Casting quality generally improves when the shot is faster. In some cases, quality is improved with higher unit pressure on the metal being cast. There are several factors which influence shot speed. It might at first be imagined that the only solution is to use larger lines and fittings and raise the accumulator pressure. It isn't that simple. It is true that in a large line from the gas charge accumulator to the shot cylinder there may be less pressure drop for a given gpm while still in the range of laminar flow. It is also true that in a larger line there is a larger mass of oil to be accelerated, taking additional energy. There is a marked loss of energy due to line turns, fittings and other oil passage conditions deviating from a smooth straight line of flow. Obtaining optimum speed suggests coming as close as possible to an ideal which has the mouth of the accumulator integral with the shot cylinder head. Although such an assembly is physically possible the result is cumbersome. This arrangement solves only half of the problem. Discharge oil from the shot cylinder rod end must be handled with the same speed, a point which is often overlooked. The ideal here is a tank mounted at the cylinder rod end with zero length of line and maximum area. This is a theoretical goal at which the designer must aim. There must be a valve isolating the cylinder from the accumulator and the tank. To make im-

FIGURE 3—Basic components of this hydraulic reservoir assure trouble-free operation, simplify maintenance. Clean-out cover at either end gives easy access to tank for cleaning interior. Screened filler cap prevents entry of dirt with refill oil.

FIGURE 4—Hydraulic system design offers easy maintenance; uses gasket type manifold plates and mounted manifold valves; reduces piping and leakage at line connections.

provements, the theoretical ultimate must first be known in order to steer in that direction.

There is a two-fold advantage in shortening hydraulic lines: first, pressure drop is reduced; second, the mass of oil moved is reduced. There is another practical aid to increased speed and reduced energy loss. Since the tank line from the shot cylinder valve (usually a 5-way valve) is a unidirectional line to the tank, it is desirable to eliminate the need for accelerating the oil in this line when making the shot. This is done by venting the tank line at the valve to keep it empty. In many cases the amount of oil in this line is considerable and a sizable amount of energy can be saved to be expended on the shot.

We have mentioned several possibilities for speeding up those functions of the die casting cycle that are generally accepted as hydraulic functions; namely, closing the die, inserting the core, making the shot, die opening and ejection. The remaining functions of most every die casting cycle should be considered—preparing the shot for zinc or aluminum, curing time, part removal and die dressing. Hydraulics made the zinc shot an automatic function. On the other hand, the aluminum shot represents a manual pouring operation that is almost universal today.

One company, presenting an exception to the general practice, has perfected a patented process of feeding aluminum automatically into the cold chamber preparatory to making the shot. Various shapes and sizes of aluminum castings have been produced in this way since 1952 and at a production rate equivalent to the automatic zinc shot process. Castings are free of aluminum oxide and hard spots, thus improving the casting's machinability. Longer die life also results from the automatic process. Although the process is not available to the general industry, it stands proof that practical progress can be made in problem areas of die casting often neglected because of their difficulties.

Curing time is a problem area. Means for shortening curing time will be welcomed in the industry. Much has already been done to automate the part removal and die dressing function of the die casting cycle. For the most part they are mechanical actions adapted to suit individual part configurations and die recesses. Techniques used in modern automatic transfer machinery have been applied. As an example, the conveyor has been used to good advantage. Ejected parts drop to a continuous belt conveyor installed below the die. Another method employs mechanical fingers timed to the die operation for reaching into the die to remove completed parts. A suitable surface is provided on the completed part for grasping by the fingers. Hydraulic actuation and control aid these operations and speed is limited only by the dependability of the mechanical function. Automatic die blow-out jets, die coating spray jets and core oilers are already in wide use throughout the industry.

To get more and better castings per hour and per day suggests a direct approach such as a faster casting cycle. The possibilities relative to hydraulics have been already investigated. Let's look briefly at how hydraulics can increase production from an indirect approach that optimizes machine operation and minimizes downtime and maintenance.

In the past few years the die casting industry has shown much interest in fire resistant hydraulic fluids.* To meet this interest most of the oil companies have developed many kinds of fire resistant fluid media. Fire resistant hydraulic fluids can be used with much success if the proper precautionary measures are taken, and many hydraulic component manufacturers have made their products compatible with these fluids. The customer needs only to specify the water base or synthetic fluid and the proper seals and packings can be provided with the components. In designing a new hydraulic circuit or adapting an old one to fire resistant fluid several recommendations should be followed. Suction strainers should be twice normal capacity. Paints should be removed from the interior of the tank when a synthetic fluid is to be used. When large size pumps are used, the tank should be elevated above the pump inlet. This may represent quite a drastic change in design but, if continued use of these new media with no foreseeable improvement in their properties is to be the practice, it seems a sensible solution to at least part of the problem.

Minimizing repairs and maintenance results in greater overall operating efficiency and more production. Maintenance, like habits, must be started correctly and practiced continually in order to derive the maximum benefits. To simplify and encourage better maintenance, emphasis should be placed on ease of maintenance in product design. Figures 3 and 4 show several items that incorporate maintenance convenience. Industrial maintenance is now a multi-billion dollar expenditure, and rising steadily. There are many cases proving preventive maintenance reduces maintenance costs substantially. Like increased production, preventive maintenance gives the profit column an attractive new look.

It is apparent that there are many approaches to the continued improvement of the die casting process. To realize these, we must first determine our goals, then accept the responsibility to develop approaches toward them. On the other hand, we should not deprive ourselves of the improvements that are already available, because it is experience with the newest approach that guides our future industrial progress.

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* **EDITORS NOTE:** Fire resistant hydraulic fluids are discussed in a series of articles appearing in previous issues of the DIE CASTING ENGINEER. *Fire Resistant Hydraulic Fluids* by John Mathe, DCE, December, 1957 and *Water Glycol Hydraulic Fluid* by E. F. Houghton and Co., DCE, September, 1958.

Chapter News

NATIONAL

President: Dean L. Rockwell,*
Clifford Rockwell Co.
Vice President: William Van Raaphorst,*
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Grand Rapids Die Cast Co.
Ollie J. Clayton*
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Holland Die Casting Co.
John Lapin,
Central Foundry Div., GMC
1 year: Harris R. Shimel,
Rex-Buckeye, Inc.
Ex-Officio: Harry Cagin,
Halex Die Casting Co.
** newly elected officers*

DEAN L. ROCKWELL

Dean L. Rockwell is a charter member of the Detroit-Saginaw Valley Chapter of the SDCE, and he has held successively the offices of Publicity Director, Trustee, Vice-President, and is now the fourth President of the Society.

Mr. Rockwell has been a supplier to the die casting and metal finishing industries for 10 years, and he is now president of his firm, the Clifford-Rockwell Co.

Born on a farm in Cass County, Michigan, 46 years ago, Dean has since graduated from Eastern Michigan College, done graduate work at the University of Michigan, taught and coached athletics and served in the navy. He also spent 16 years as a part time professional wrestler in the U.S., Canada and England.

Dean brings to the society an extensive background in the organization and administration of society affairs. This, combined with his familiarity with all phases of SDCE affairs will assure the continued rapid growth and progress of the Society.

William Van Raaphorst is a graduate of the Westinghouse Engineering School, and he served in the U.S. Army Corps of Engineers during WW II. His selling of machines and die casting equipment led him to his present post as Vice President and General Manager of American Mold Engineering Company.

John L. Weston began his career as a casting machine operator, served his time in the tool and die room and worked up by his ability and ambition to top management. He is now Vice President and Manager of the Grand Rapids Die Casting Company, a subsidiary of National Malleable and Steel Casting Corp.

Ollie J. Clayton learned pattern making in high school, and he took mechanical engineering at Virginia Polytechnic Institute. His history includes work in sand casting and positions as Product Development Engineer, Assistant Chief Engineer of an aluminum and magnesium die casting plant and recently as General Manager of a die cast tool shop.

NEW EXECUTIVE SECRETARY

Our new executive secretary, **Earl R. Mason,** has a broad experience in the Die Casting Industry. For eleven years he has been management consultant to W. J. During, president of Precision Castings Company, second largest die casting company in the country. From 1941 to 1947 he was district manager of the War Production Board and Civilian Product Administration, serving a large part of New York State with 1700 industrial plants. During this period he also served on the advisory board of the War Manpower Commission.

He has been an industrial management consultant with offices in Syracuse, New York and Washington, D.C., and an active member in a number of societies and associations in industrial and commercial fields.

With the cooperation of the officers and directors of the Society of Die Casting Engineers, Mason has started a program of added activities which will greatly increase the services offered to members of the Society. The objective is to rapidly increase the number of members and the size and circulation of our publication, THE DIE CASTING ENGINEER.

1 DETROIT and
2 SAGINAW VALLEY

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4 TOLEDO

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25 INDIANA

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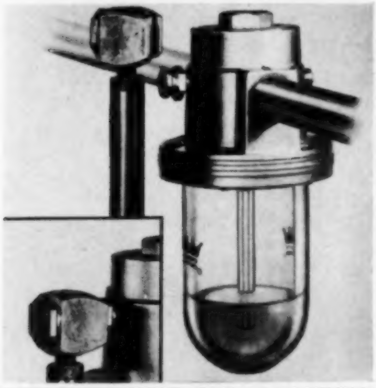
NEWS of the INDUSTRY



New Jersey Zinc sets up new sales district

The **New Jersey Zinc Company** has extended its sales representation by establishing a new sales district for the West Coast area with headquarters in Los Angeles. John S. Collbran, Jr., formerly Western District Sales Manager at Chicago, will serve as Pacific District Manager.

James P. Sheridan, formerly manager of Pigment Sales, Western District, has been appointed Western District Manager.

Greenlee Brothers acquires Buss Machine Works

The purchase of the Buss Machine Works and its subsidiary, B & T Machinery Company, both in Holland, Michigan, was announced by A. H. Eggers, president of **Greenlee Brothers and Company**, Rockford, Illinois.

Greenlee Brothers and Company has long been recognized as a major machine tool builder serving the metalworking industries. Their acquisition of B & T Machinery Company adds a new line of die casting machines to the Greenlee line of standard and special machine tools.

Bohn Aluminum & Brass Corp. advances:

The Directors of **Bohn Aluminum and Brass Corporation** announced some important advancements of officers of the company. **Simon D. Den Uyl**, formerly President, was elected Chairman of the Board. **Terry W. Kuhn**, formerly Executive Vice President, was elected President. **Richard C. Aylward**, General Sales Manager, was elected Vice President–Sales. **H. Blake Thomas**, General Manager of the Betz Division, was elected Vice President. At the same time the directors announced the election of a new Director of the company; he is **Guy H. Pitts**, Vice President–Manufacturing.

Remote Fill Serves Out-of-reach Lubricators

A new "remote fill" device that allows easy servicing of air line lubricators located in hard to reach places has been announced by **Hannifin Co.**, Des Plaines, Illinois, a division of Parker-Hannifin Corp.

The heart of this new device is a specially designed button head coupler which quickly engages the lubricator and a rigid extension of the oil delivery line from a portable hand pump.

Duncan Hannah appointed Standards Committee Chairman

Duncan Hannah, Die Cast Designs, has been appointed chairman of the Standards Committee, replacing **John Lapin**. Mr. Lapin has resigned to become Assistant Chief Engineer at General Motors Central Foundry, Saginaw, Michigan.

Mr. Hannah has spent a number of years in die casting design and is very well qualified to hold this post.

DIE CASTING SERVICE AND PERSONNEL OPPORTUNITIES

This section is open to everyone associated with the arts and sciences of Die Casting. The editorial staff reserves the right to reject any advertising not related to Die Casting and its allied arts.

As a service to the Die Casting Industry, we offer space at a minimum of $10.00 for the first column inch and $10.00 for each additional column inch or any part thereof, payable in advance.

To answer box number advertisements, address responses to the box at Die Casting Engineer, 19370 James Couzens Highway, Detroit 35, Mich.

Closing Date: 15th of Month preceding publication.

LONG ESTABLISHED DETROIT SALES AGENCY seeking representation for zinc and aluminum die casting company. Preferred location western Michigan. Write Box 108.

ESTABLISHED INDIANA multishift die cast plant requires a man with a proven record of supervisory experience to assume full responsibility of casting division. Will report directly to Mfg. V.P. Applicant must have a thorough knowledge and extensive experience in zinc die casting and trim operations. Send resume and salary requirement to Box 109.

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